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| 09/172,553 | 10/14/1998 | JAMES E. GREEN | 2914.IUS | 9441 |

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EXAMINER

DIAZ, JOSE R

| ART UNIT | PAPER NUMBER |
|----------|--------------|
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2815

DATE MAILED: 06/25/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/172,553

Applicant(s)

GREEN ET AL.

Examiner

José R. Díaz

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 12 April 2002.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 31-35 and 37-45 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 31-35, 37-45 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 112

- The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

- Claims 37-41 and 44-45 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Regarding claims 37-41 and 44-45, the limitations providing a HSG polysilicon layer on said storage poly structure and lining the recesses with a dielectric material are not supported by the Specification. For instance, see Figures 7-10 wherein Applicant shows that the HSG polysilicon layer (122 or 130) is removed before the dielectric (138) is formed.

Claim Rejections - 35 USC § 102

- The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

- Claims 35 and 42-43 are rejected under 35 U.S.C. 102(b) as being anticipated by Kenney (US Patent No. 5,254,503).

Regarding claims 35 and 43, Kenney teaches an intermediate structure (see cols. 1-6) comprising: a storage poly structure (10) with recesses (20) formed therein (see Fig. 4); a HSG polysilicon layer (14) over said storage poly structure (see Figs. 1-

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4); and a mask (16) over said HSG polysilicon layer (see Figs. 2-4), said recesses (20) being exposed through said HSG polysilicon layer and said mask (see Fig. 4).

Regarding claim 42, Kenney teaches an intermediate structure (see cols. 1-6) comprising: a storage poly structure (10) (see Fig. 4); a substantially confluent HSG polysilicon layer (14) over said storage poly structure (see Figs. 1-4); and a mask (16) over said substantially confluent HSG polysilicon layer (see Figs. 2-4), elevated portions of said hemispherical-grain polysilicon layer being exposed through said mask (see Fig. 3).

Claim Rejections - 35 USC § 103

➤ The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

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➤ Claims 31-32 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Ahn et al. (US Patent No. 5,358,888).

Regarding claim 31, Ahn et al. teach a semiconductor capacitor storage poly (see cols. 1-12) comprising downwardly extending recesses (see recesses formed in the storage poly 100 in Figures 6, 16, and 19); and a plurality of contiguous mesas forming a maze-like structure (100) (see Figures 6, 16, and 19).

Regarding claim 32, Ahn et al. teach that said mesas extend in the X, Y and Z coordinates (see Figures 6, 16, and 19).

➤ Claims 33-34 and 38-41 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ahn et al. (US Patent No. 5,358,888) in view of Kenney (US Patent No. 5,254,503).

Regarding claims 33 and 38-41, Ahn et al. teach a semiconductor capacitor storage poly (see cols. 1-12) comprising downwardly extending recesses (see recesses formed in the storage poly 100 in Figures 6, 16, and 19); and a plurality of contiguous webs forming a maze-like structure (100) (see Figures 6, 16, and 19). However, Ahn et al. fail to teach a HSG polysilicon on top surfaces of at least some of said plurality of contiguous webs. Kenney teaches a well-known process for forming webs or mesas in a capacitor storage poly (see cols. 1-6) comprising the steps of: growing and masking an HSG polysilicon (14) (see Fig. 2); etching the mask (16) to expose portion of the HSG polysilicon (see Fig. 3); and etching openings (20) so that portions of the HSG polysilicon remain on top surfaces of the webs (see Fig. 4). Therefore, it would have

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been obvious to one having ordinary skill in the art at the same time the invention was made to modify Ahn et al. to include HSG polysilicon on top surfaces of at least some of said plurality of contiguous webs. The ordinary artisan would have been motivated to modify Ahn et al. in the manner described above for at least the purpose of providing enhanced surface area and increased capacitance. Furthermore, Ahn et al. fail to teach a dielectric layer substantially coating an upper surface of said storage poly structure and substantially lining each of said plurality of recesses. Kenney teaches that it is well known in the art to provide a dielectric layer (22) and a polysilicon layer (24) on the storage poly structure (see Fig. 4). Therefore, it would have been obvious to one having ordinary skill in the art at the same time the invention was made to modify Ahn et al. to include a dielectric layer (22) and a polysilicon layer (24) on the storage poly structure. The ordinary artisan would have been motivated to modify Ahn et al. in the manner described above for at least the purpose of forming a capacitor of enhanced capacitance.

Regarding claim 34, Ahn et al. teach that said mesas extend in the X, Y and Z coordinates (see Figures 6, 16, and 19).

➤ Claims 37-39, 41 and 44-45 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Kenney (US Patent No. 5,254,503).

Regarding claims 37-38, Kenney teaches an intermediate structure (see cols. 1-6) comprising: a storage poly structure (10) (see Fig. 4); low elevation regions of a HSG

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polysilicon layer (14) over said storage poly structure (see Figs. 1-4); recesses (20) (see Fig. 4); and dielectric material (22) at least lining the recesses (see Figs 4 and 5).

Regarding claim 39, Kenney teaches a cell poly structure (24) over said dielectric layer (see Fig. 5).

Regarding claim 41, Kenney teaches that at least some of said plurality of recesses (20) extends into said storage poly structure (10) (see Figs. 4 and 5).

Regarding claims 44-45, Kenney teaches an intermediate structure (see cols. 1-6) comprising: a storage poly structure (10) with recesses (20) formed therein (see Fig. 4); a HSG polysilicon layer (14) over said storage poly structure (see Figs. 1-4); a mask (16) over said HSG polysilicon layer (see Figs. 2-4), said recesses (20) being exposed through said HSG polysilicon layer and said mask (see Fig. 4); and a dielectric material (22) lining at least said recesses (see Fig. 6).

Response to Arguments

Applicant's arguments with respect to claims 31-35 and 37-45 have been considered but are moot in view of the new ground(s) of rejection.

With regards to the rejections under § 112, Applicant argued that the limitations described in the claims are supported by the Specification. However, the Examiner disagrees. As acknowledges by Applicant, Figure 8 and page 8, lines 10-20 disclose the presence of the HSG layer (122) prior to dielectric deposition (138) of Figure 10. Page 8, lines 21-26, Applicant further describes that the remaining mask (124) is removed, and a dielectric layer (138) and a polysilicon layer (140) are formed. However, Applicant does not provide a clear description in order to account for the remaining HSG

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after the mask (124) is removed. As a matter of fact, the argument presented by Applicant is inconsistent with the drawings, since the HSG layer (122) shown in Fig. 8 is no longer illustrated in Fig. 9. Therefore, due to the absence of any further description, the HSG is considered to be removed from the structure prior to the deposition of the dielectric (138). Further, Applicant is invited to provide evidence proving that the HSG is not removed from the structure. For example, Applicant should point out the presence of HSG in Figures 9-10.

With regards to the rejections under §102 and §103, Applicant is advised that the references do teach a contiguous structure. As acknowledges by Applicant, the term "contiguous" refers to structures "that share a boundary" (see Remarks). Thus, the prior arts Kenney (US Pat. No. 5,254,503) and Ahn et al. (US Pat. No. 5,358,888) anticipate the claimed limitations since both references disclose structures "that share a boundary". For example, Kenney teaches mesas structures defined by the openings 20 that share the same bottom surface (10) in Figure 4; and Ahn et al. teach mesas structures defined by the openings that share the same bottom surface (100) in Figures 6, 16, and 19.

With regards to the argument about the combination of Ahn et al. in view of Kenney, Applicant is advised that both references used the HSG as an etching mask (see for example, Ahn et al., col. 9, lines 48-50 and Kenney, col. 4, lines 18-29 and 38-40), and the motivation can be found in col. 5, lines 2-5 of Kenney. Thus, the references Ahn et al. and Kenney are combinable since they are from the same field of endeavor and a motivation was provided.

Conclusion

➤ **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to José R. Díaz whose telephone number is (703) 308-6078. The examiner can normally be reached on 9:00 - 5:00 Monday, Tuesday, Thursday and Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie C. Lee can be reached on (703) 308-1690. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 746-3891 for After Final communications.

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Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

JRD
June 19, 2002

A handwritten signature in black ink, appearing to read 'Eddie Lee', with a large, sweeping initial 'E'.

EDDIE LEE
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800